

	<p>Ministry of Higher Education and Scientific Research - Iraq</p> <p>University of Warith Al_Anbiyaa Engineering Department</p> <p>Refrigeration and Air Conditioning Techniques Engineering</p>	
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## MODULE DESCRIPTION FORM

### نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Thermodynamics 1		Module Delivery
Module Type	C	<input type="checkbox"/> Theory <input checked="" type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar	
Module Code	MPAC108		
ECTS Credits	8		
SWL (hr/sem)	200		
Module Level	1		
Administering Department	Refrigeration and Air Conditioning Techniques	College	Engineering
Module Leader	Audai Hussein	e-mail	audai.hussein@uowa.edu.iq
Module Leader's Acad. Title	Professor Doctor	Module Leader's Qualification	PHD
Module Tutor	Zainab Abdul Karim Salem	e-mail	zainab.abdelkarim@uowa.edu.iq
Peer Reviewer Name		e-mail	
Scientific Committee Approval Date	15 /10/2024	Version Number	1.0

<b>Relation with other Modules</b> العلاقة مع المواد الدراسية الأخرى			
<b>Prerequisite module</b>	NA	<b>Semester</b>	
<b>Co-requisites module</b>	NA	<b>Semester</b>	
<b>Module Aims, Learning Outcomes and Indicative Contents</b> أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية			
<b>Module Aims</b> أهداف المادة الدراسية	Studying the principles of thermodynamics including, thermal systems according to energy interactions with their direct surroundings, the differences in the properties of both the system and the surrounding with their engineering applications		
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<ol style="list-style-type: none"> <li>1. To know the basic properties of material with units</li> <li>2. To know the laws of thermodynamics</li> <li>3. To know the phases of substance</li> <li>4. To know the basic thermodynamic cycles</li> <li>5. To know the entropy</li> <li>6. To know the basics on combustion</li> </ol>		
<b>Indicative Contents</b> المحتويات الإرشادية	<p>Indicative content includes the following.</p> <p><u>Part A – Laws of thermodynamics</u> First and second law of thermodynamics. [24 hrs.]</p> <p><u>Part B – P-V diagram</u> P-v diagram of water and different gases. Phases of the water and substances. [16 hrs.]</p> <p><u>Part C – Thermal cycle</u> Carnot cycle, vapor cycle, steam cycle, gas cycle, Otto cycle, Diesel cycle, dual cycle, and dual cycle. [58 hrs.]</p> <p><u>Part D – Combustion</u> Combustion, combustion and equilibrium equations [24 hrs.]</p>		

<b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم					
<b>Strategies</b>	Assessment is based on hand-in assignment, written exams, case study, quizzes, seminars and practical testing.				
<b>Student Workload (SWL)</b> الحمل الدراسي للطالب					
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	144	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعيا	10		
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	56	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعيا	10		
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	200				
<b>Module Evaluation</b> تقييم المادة الدراسية					
	<b>Time/Number</b>	<b>Weight (Marks)</b>	<b>Week Due</b>	<b>Relevant Learning Outcome</b>	
<b>Formative assessment</b>	<b>Quizzes</b>	5	5 % (5)	2,5,8,10,13	LO # 1, 4, 5, 7,8
	<b>Assignments</b>	5	5 % (5)	1,4,7,11,15	LO # 1-15
	<b>Lab.</b>	10	10 % (10)	1-9	LO # 1-15
	<b>Report</b>	10	10 % (10)	1-8	LO # 1-15
<b>Summative assessment</b>	<b>Midterm Exam</b>	3 hr.	20 % (20)	9	LO # 1-15
	<b>Final Exam</b>	3 hr.	50% (50)	15	All
<b>Total assessment</b>		100% (100 Marks)			
<b>Delivery Plan (Weekly Syllabus)</b> المنهاج الاسبوعي النظري					
	<b>Material Covered</b>				
<b>Week 1</b>	Introductions, references, units, pressure, force, work, Temperature, unit of temperature and conversion, temperature measurements. Zeorith law of Thermodynamics. Energy, types of energy, positional, kinetic, internal and flow energy energies. Heat and work, power, enthalpy.				
<b>Week 2</b>	First law of thermodynamics, Steady flow energy equation for open system, non-flow energy equation Transient state,				

<b>Week 3</b>	Ideal gas, Boyle's law and Charles law and equation of state, Specific heat at constant pressure and constant volume, Closed system processes using ideal gas. Isometric and isobaric processes
<b>Week 4</b>	Isothermal and adiabatic processes, Polytropic processes, Control volume processes
<b>Week 5</b>	Vapour, phase of substance, Phase change curve on P-V diagram. Dryness fraction, liquid and vapour lines, wet vapour
<b>Week 6</b>	Steam tables and Examples on steam tables, Super-heated vapour, tables of super-heated tables
<b>Week 7</b>	Processes using two phase system, processes on P-V diagram, Irreversible processes Closed system, Second law of thermodynamics, heat engine, heat pump
<b>Week 8</b>	Carnot cycle and reversed Carnot cycle. Irreversible and reversible processes
<b>Week 9</b>	Clausius in equality for second law, Entropy on T-S and entropy calculations.
<b>Week 10</b>	Entropy for vapour, Entropy for system and surroundings, Isentropic efficiency
<b>Week 11</b>	Air standard cycle, Otto cycle. Diesel and Dual cycles
<b>Week 12</b>	Steam power plants- Rankin Cycle, Rankin Cycle with superheated. Modified Rankin Cycle
<b>Week 13</b>	Modification on Carnot to use as vapour compression cycle. Vapour compression cycle,
<b>Week 14</b>	Combustion, combustion equations, equilibrium of combustion equation. Volumetric analysis on combustion process
<b>Week 15</b>	Final exam

### Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	<b>Material Covered</b>
<b>Week 1</b>	Measurement and instruments
<b>Week 2</b>	Types of temperature measurements
<b>Week 3</b>	Measuring the velocity of air
<b>Week 4</b>	Calibration of thermocouple
<b>Week 5</b>	Joule experiment
<b>Week 6</b>	Boyle Experiment
<b>Week 7</b>	Measuring of C.V of fuel
<b>Week 8</b>	Measuring specific heats
<b>Week 9</b>	Finding the law of expansion
<b>Week 10</b>	Measuring the latent heat of evaporation
<b>Week 11</b>	Heat pump
<b>Week 12</b>	finding of the degree of superheating

<b>Week 13</b>	Performance of simple compression cycle
<b>Week 14</b>	Actual vapour compression cycle
<b>Week 15</b>	Final exam

### Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
<b>Required Texts</b>	Borgnakke, C. and Sonntag, R.E., 2022. <i>Fundamentals of thermodynamics</i> . John Wiley & Sons. Cengel, Y.A., Boles, M.A. and Kanoğlu, M., 2011. <i>Thermodynamics: an engineering approach</i> . New York: McGraw-hill. Rajput, R.K., 2005. <i>A textbook of engineering thermodynamics</i> . Laxmi Publications.	Yes

### Grading Scheme

مخطط الدرجات

Group	Grade	التقدير	Marks (%)	Definition
<b>Success Group (50 - 100)</b>	<b>A - Excellent</b>	امتياز	90 - 100	Outstanding Performance
	<b>B - Very Good</b>	جيد جدا	80 - 89	Above average with some errors
	<b>C - Good</b>	جيد	70 - 79	Sound work with notable errors
	<b>D - Satisfactory</b>	متوسط	60 - 69	Fair but with major shortcomings
	<b>E - Sufficient</b>	مقبول	50 - 59	Work meets minimum criteria
<b>Fail Group (0 - 49)</b>	<b>FX – Fail</b>	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	<b>F – Fail</b>	راسب	(0-44)	Considerable amount of work required

**Note:** Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.